

INTERNATIONAL CITY MANAGERS' ASSOCIATION

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## PUBLIC EMERGENCY COMMUNICATIONS SYSTEMS

What are the essential features of the telephone type of emergency reporting system, what are the advantages and disadvantages of this system, and what cities have installed it? What other types of emergency communication systems are in use or under consideration?

Municipal officials since the end of World War II have been faced in many cities with the need either of overhauling and extending their coded telegraph box alarm systems or installing some other type of system. Many such cities have hesitated to install or rehabilitate their telegraph systems not only because of the high cost but also because the great majority of alarms received over the box system are false. City officials believe that developments in the field of electronics should result in a better and more flexible system than the telegraph boxes.

Approximately two-thirds of the cities over 10,000 population have public fire alarm systems (694 out of 1,093 cities reporting), and one-third (399 cities) have no street fire alarm boxes, according to the 1953 Municipal Year Book (254 cities between 10,000 and 25,000 did not report). The 1953 Year Book shows for each of the 694 cities the number of street fire alarm boxes which had been installed. Cities of 10,000 to 25,000 had an average of 55 boxes per city, while the cities between 250,000 and 500,000 had an average of 541 boxes. Some cities had such a small number of street fire alarm boxes that they probably could eliminate them entirely without adversely affecting the grading of the city's fire defenses.

An important development in recent years is that the telephone companies are now willing to provide broad communications service to cities covering all types of systems. During the past year or so a score of cities have installed a telephonic system for both fire and police calls as well as for reporting other public emergencies. Important developments also have taken place in radio and microwave systems. Cities that have installed the telephone system generally use teletype, voice-paging, and radio for transmission of alarms to fire stations instead of the usual coded circuits.

While some cities have contracted for the leased telephone system, others have extended their coded telegraph systems. In 1954 the Gamewell Company (Newton Upper Falls, Mass.) published a 37-page report, entitled "Telephone vs. Telegraph Fire Alarm Systems," which contained a list of more than 100 cities which the company said had installed new fire alarm systems or made major improvements or extensions in the preceding five years. Cincinnati in 1955 added ten circuits and 186 street fire alarm boxes to its alarm system, making a total of 1,449 boxes in operation.

Still other cities have abandoned their coded telegraph systems. Rockford, Ill. (105,000), abandoned telegraphic box alarms in 1947. During the last year of operation 100 of the 122 alarms were false. Since then the city has used a dispatching system based on local telephone company equipment and two-way FM radios on all fire equipment. Specially designed equipment operates a public address system in all fire stations. Sarnia, Ontario (34,697), discontinued its telegraph box system on May 21, 1953, when a tornado did extensive damage and the city has since



relied on ordinary telephones. To rehabilitate the box alarm system would have cost an estimated \$250,000. During the 11-year period ending with May, 1953, Sarnia had 2,277 telephone alarms and only 31 were false alarms. During the same time 325 box alarms were received and 262 were false.

More than two-thirds of all fire calls in the average city are received over home and business telephones, and in some cities as high as 90 per cent are received in this manner because of the general availability of telephones. Fire department personnel, however, do not like to rely wholly on regular exchange telephone service and yet ordinary telephones are a valuable auxiliary to any alarm system. In addition, police call boxes have been made available in many cities for emergency use by the general public. In many cities the telephone companies have also installed telephone booths along city streets and in public places.

In small cities the telephone central station operator frequently has to perform the service handled in the larger places by the fire department telephone operator. The telephone operator receives calls and sends out the alarm over whatever outside sounding apparatus is provided, either by means of a key or a simple fire alarm transmitter. In addition, she may call one or more of the chief officers of the fire department and notify them of the fire.

In cities where there is an alarm system, the telephone company transfers all fire calls direct to the fire department operator who has the responsibility for them. The use of ordinary telephones in the fire service is discussed in detail in the new edition of "Municipal Fire Administration" which will be published in the spring of 1956 by the International City Managers' Association.

#### The Telephone Type of System

Telephone emergency reporting systems are owned and operated by two cities, while such systems in other cities are installed by the telephone company which also owns and maintains the equipment and the city operates it. The latter plan, known as the leased telephone system, has been installed in 20 cities as of January, 1956. Information about the installations in these cities is presented later in this report. This section discusses the development and operation of the leased telephone plan, its advantages and disadvantages, opposition to the system, and the position of the National Board of Fire Underwriters.

Development. The first American city to install a leased telephone system was Roanoke, Va. (92,000). In 1949 the city installed 26 emergency phones in boxes on posts at street intersections (see photo on last page). The phones can be used by citizens for fire or police calls or for any other public emergency, and also by city employees. The phones are connected with the desk sergeant's office in the police department. City Manager Arthur S. Owens has reported that a fire alarm can be turned in by telephone in a minimum of four seconds as compared with a maximum of 30 to 40 seconds on the Gamewell system. In Roanoke 90 per cent of all false alarms had been received over the Gamewell system, and 90 per cent of all fire calls came over the telephone. The city manager writes that "our Gamewell system is antiquated and the flexibility and economies of the telephone is a modern approach to furnish a better service to our city."

Also in 1949 an important step was taken in London, England, when the London County Council decided to abolish its 68-year old box alarm system and install a public telephone call-box system called the "999 system" which is widely used in England for emergency calls. The dialing of 999 without the use of coins gives an emergency signal in the telephone exchange, and the operator immediately connects



the caller to the emergency service required, i.e., police, fire brigade, or ambulance service. This is similar to the emergency service provided by the telephone companies in this country in which the numeral "0" is dialed to reach the operator.

This step was taken partly because of the increased use of the ordinary telephone in making fire calls in London, and also because of the sharp increase in false alarms over the box alarm system which was based on Gamewell principles. Over 76 per cent of all fire calls over the 1,727 street box alarms in 1948 were malicious false alarms. Regarding the "999" system the clerk of the London County Council has written that "the fire brigade can be connected within an average of 26 seconds of dialling . . . apparatus drivers are given the actual address of the fire instead of the location of the street box alarm."

It was only natural that the officials of other cities would consider the possibility of wider use of the telephone for emergency use. In August, 1950, the staff of the International City Managers' Association conferred with representatives of the American Telephone and Telegraph Company with regard to developing a system that would serve both fire and police departments. The first working plan was completed in 1953 when the city of Miami, Fla., in conjunction with the Southern Bell Telephone and Telegraph Company, became the first city in the country to install a complete telephonic alarm system. The Miami fire-police telephone system received nationwide publicity in an article by Karl Detzer, entitled "In Case of Fire. . .," in the September, 1954, issue of the Reader's Digest.

A second city, Two Rivers, Wis., also installed a telephone system in 1953. The third city to act was Syracuse, N. Y., where in the spring of 1953 the mayor requested the city's Bureau of Municipal Research to make a study of the fire alarm system to determine the advisability of rehabilitating the 40-year-old telegraph alarm system or adopting an alternate system. Late in 1953 the bureau recommended that a telephone alarm system be installed, and the mayor in May, 1954, approved the plan and appointed a committee to work out the details for the installation. But the small city of Solvay, N. Y., near Syracuse, got ahead of its big neighbor and installed the telephone system in November, 1954.

Except for Solvay, N. Y., no other cities installed the leased telephone system in 1954, but Medford, Ore., installed a city-owned system. During 1955 and early 1956, more than a dozen other cities installed or contracted for the system designed by the telephone companies, including Omaha, Neb.; New Orleans, La.; Sioux Falls, S.D.; Lynbrook and Massena, N.Y.; Indianapolis and Muncie, Ind.; Sheboygan, Wis.; Hasbrook Heights, Highland Park, Lyndhurst, North Bergen, Phillipsburg, and Princeton, N.J.; and Kingston, Ontario. Thus by January, 1956, a total of 20 cities had either installed the leased telephone system or were in the process of installing it, and two other cities, Medford, Ore., and Minneapolis, Minn., had city-owned telephone systems.

#### How the Leased Telephone System Operates

The leased telephone system is installed and maintained by the telephone company. It is used for transmitting emergency calls for police, fire, or ambulance service and for reporting accidents or any other emergency requiring the attention of a city department.

A standard feature of the telephone emergency reporting system is a conventional nondial telephone, which does not require deposit of a coin, installed in a nonlocking water-proofed aluminum box with a self-closing door. In the systems contracted for to date each telephone is connected by an individual line to a switchboard at fire



headquarters. These reporting lines are under continuous electrical test and visual and audible trouble signals instantly notify the dispatcher of any individual box or line that is out of order. If a box becomes inoperative, the remainder of the system is not affected as is the case of the conventional series alarm system.

The instant a person reporting an emergency raises the phone from the hook, a light flashes on the switchboard at fire headquarters indicating the number and location of the call box, and an alarm bell sounds until the call is answered. Once in contact with the operator-dispatcher at fire headquarters the person is able to report the essential details of the emergency and the exact location. If the person making the report does not or can not give the location and description of the fire or emergency, designation strips above the flashing light will instantly give the dispatcher the location of the box. Any number of calls from any number of boxes can be received at the same time and provision has been made for two attendants to operate the switchboard.

Special facilities engineered into the system enable patrolmen and police officers to bypass the fire department and talk directly to the police department operator. In this manner police can relay any requests or information and make regularly scheduled reports to headquarters.

Terminating switchboards employing pushbutton keys for answering incoming calls can be provided at both fire and police headquarters. Voice recorders automatically record the handling of each call and graphic recorders automatically print the date and time of each call and the number of the call-box. The system has its own power supply at the switchboard and an emergency battery supply provides standby power in case of a power failure.

To relay the alarm to the fire station which must respond several methods of selective alerting can be employed. Pushbutton keys on the switchboard select voice alarm circuits which terminate in amplifiers and loudspeakers in each fire station. A distinctive alerting tone can be sent before transmission of the dispatch information and the facilities available permit the dispatcher to call any one station, group of stations or all stations simultaneously. Each fire station can also be connected to fire headquarters by a direct telephone line under continuous test and used only for dispatching purposes. Stations can also be notified and equipment dispatched by means of radio. A printed record showing the location and type of fire, equipment dispatched and time of the dispatch can be made on teletypewriters which connect each fire station with fire headquarters.

As units of fire apparatus leave the fire station this information can automatically be shown on the switchboard by a lamp. These lamps may also appear in a map of the city and indicate at a glance which pieces of apparatus from the various stations are in use. As fire trucks call in by radio to report that they are returning to the fire station and ready for reassignment, additional colored lamps may be lighted, the switchboard and map thus maintaining a current report on the status of all fire fighting equipment.

Advantages of the Telephone System. After the city of Syracuse, N. Y., decided to install the leased telephone system, the Bureau of Municipal Research of that city in May, 1955, issued a report entitled "The Syracuse Fire Alarm System," which incorporated much of the data presented in its earlier reports and the following information is quoted with permission from pages 9-16 inclusive:

"1. Utility. The ability of the person reporting a fire to give the exact location and description of the blaze enables the fire department to dispatch the



correct number of apparatus directly to the scene in the shortest possible time. Miami reports that the new system . . . cut(s) off at least (2) minutes in the dispatching of the fire equipment.

"While it is still possible to report a malicious false alarm by telephone, experience elsewhere indicates that telephones will help eliminate this troublesome problem. Further confirmation is seen in experience with alarms in Syracuse. There are in excess of 60,000 private telephones in the city and yet they are rarely used to send a false alarm.

"From the point of view of the citizens reporting a fire, a telephone conversation with the dispatcher will bring reassurance that an alarm has been reported and that help is on the way. The person is free to return to the blaze to offer assistance. With the telegraph system, the person is not always sure that a fire has been reported when the lever is pulled and of course it is necessary to remain on the corner to direct apparatus to the blaze.

"The telephone alarm system will enable alarm headquarters to selectively alert individual fire companies and thus makes available a central dispatch system not possible under the telegraph system.

"In addition to fire protection a city offers many other emergency services to protect the lives and property of its citizens. A corner emergency telephone will provide a rapid and sure method of reporting to responsible authorities, accidents, police calls, ambulance calls, broken water mains, fallen street barricades, exposed high tension wires, requests for emergency inhalators and dozens of other emergency calls. Central dispatch personnel will quickly connect the person in distress with the proper authority. All nonfire emergency calls will be transferred to the police department dispatch office.

"2. Reliability. A communications system to be adaptable for use in transmitting emergency messages should have a built-in testing feature that will immediately notify authorities of any trouble in the system which will make it inoperative. Each of the corner telephone boxes will have an automatic testing feature which causes a white light to flash directly over the central switchboard jack in case of trouble on the line. This testing, or "supervision" feature as it is called, also applies to all the lines which terminate in the central switchboard. Should an excited person reporting a fire accidentally pull the wire from the box, it will cause the white light to flash on the switchboard and the dispatcher will send a piece of apparatus to the box. In the event of trouble on any line, day or night, the dispatcher merely notifies the telephone company, which will dispatch repair ~~men~~ to the affected box or boxes.

"All but a negligible part of the telephone circuits is in cable. Much of this cable is in underground ducts and is under constant test. Each corner box is on a separate set of two wires, and disability of one telephone will not affect any other part of the system.

"Last fall (1954) hurricane "Hazel" passed through the city and gave both telegraph and telephone a critical test. At the height of the storm 167 of the corner telegraph boxes and some of the secondary alarm circuits were inoperative. By contrast, the police telephone call box system, similar to that being installed and containing 50 boxes, was completely intact, with not one box reported out of service. Literally hundreds of telephone calls were received for the most part reporting fallen power wires. During the same period, five telegraph boxes were pulled, one of them was a malicious false alarm. Four turned out to be prompted by fallen wires.



"3. Flexibility. New telephones can be installed at any location at a cost of \$3.00 for the installation and \$2.50 per month rental, plus wire mileages. Telephones can be installed at swimming pools during the summer to be used to report accidents and calls for respirators. At the end of the swimming season, the telephones can be disconnected and the rental charges discontinued. The ability to install telephones for short periods of time at low rental and installation cost is also important for extending protection to transient events such as circuses and other entertainments.

"In view of rapid developments in the field of electronics and radio, it is conceivable that the city may, in the near future, wish to adopt a completely new alarm system. In that event the telephone system can be discontinued without penalty and the rent discontinued.

"In the past it has been nearly impossible to extend the telegraph system to match the growth of the city. To install an alarm box in a new development required the extension of city-owned cable to the new location, often at great expense. Under the terms of the telephone contract, the city has only to notify the company of a location where a box is desired and within two weeks the telephone will be installed at charges as listed above.

"4. Maintenance. One of the problems of a city-owned telegraph alarm system is maintenance. As previously noted, the city in the last 10 years has spent in excess of \$250,000 to keep the system in operation. This did not include monies to extend the system significantly or to make basic repairs. It would be necessary to rehabilitate the entire system completely if the city had decided to retain the telegraph system.

"With the installation of a telephone system the city will be absolved of all but two minor maintenance responsibilities. Any difficulty with the system will be reported to the company which maintains 24-hour emergency service. In the event of storm or natural disaster, the city has priority on maintenance and the telephone company can draw upon the resources of the entire Bell System to restore the system as quickly as possible.

"In the event of a telephone company strike management employees of the telephone company who have been trained to perform maintenance duties will be available to make necessary repairs.

"The city will be responsible for the stenciling on the corner telephone boxes. This work can be performed by firemen who are temporarily disabled for regular fire duty. The city will also be responsible for the maintenance of 20 fire station gongs which will be handled by the regular maintenance section of the Department of Fire.

"5. Capital Investment. Estimates of the cost of repairing the telegraph alarm system have ranged from \$273,000 to \$670,000. The nonrecurring installation charges for the telephone system will be \$7,515.

"6. Over-all Costs. Installation of the telephone system will save the city \$16,000 per year over the cost of rehabilitating the telegraph system. These savings are possible because of discontinued maintenance costs, savings in elimination of the cost of amortizing the capital investment for the rehabilitated telegraph system, and savings in termination of the rental of the 50-box police call system which will be combined with the emergency telephone system.



"Cost Breakdowns are as Follows:

"A. Yearly Cost of Rehabilitating Telegraph System

Maintenance

Personnel

Present personnel (6) augmented by  
labor positions (2), including city  
contributions to pensions.

\$33,515.00

Equipment and supplies

6,500.00

Amortization

Yearly cost of amortizing rehabilitation  
capital costs of \$273,000\* over 25-year  
life of the system with no interest charges.

10,921.00

Police Call Box Rental

Yearly rental of present police call  
box system

9,463.00

Total Yearly Cost

\$60,399.00

"B. Yearly Cost of Renting Complete Telephone System

Yearly rental

\$44,089.80

Amortization

Yearly cost of amortizing non-recurring  
installation charge of \$7,515.00 over 25  
years with no interest charges (for com-  
parison purposes).

300.00

Total Yearly Cost

\$44,389.80

Annual Saving

\$16,009.20

\*Minimum estimate.

"These cost comparisons do not include the savings to the city of the salvage of the present cable, corner boxes, and central office equipment. Nor do they include the salvage of thousands of feet of cable and other equipment items presently on hand, nor the value to the city of two repair trucks and a supervisor's car which will be available for assignment to other duties.

"Formal application has also been made to civil defense authorities for federal Civil Defense matching funds for the installation and yearly rental costs of the telephone system. The new telephone communications system will be a great value both during the evacuation phase of civil defense emergency and during the recovery period and the city feels it will justify the expenditure of federal funds to help defray the costs.

"One cost not included in the comparison is the cost of teletype. It is contemplated that teletype will be added at a later date. There will be one sending set located at central dispatch headquarters and receiving sets located in each fire station throughout the city. The teletype system will be used as an auxiliary method of communicating fire alarms in the event of failure of the other five systems and



to report hydrants out of service, buildings being fumigated, streets blocked, sprinklers out of order, company assignments, civil defense bulletins, administrative orders, transfers, and departmental policies.

"It will cost \$360 to install teletype and there will be an annual rental for the entire system of \$6,330.00. The cost is not included in the comparison of costs between telegraph rehabilitation and the telephone system because teletype is a necessary addition to the communications system of any modern fire department and should be added regardless of the other methods of communications, telegraph, radio or telephone. This is also true of the cost of lighting the corner boxes which should be done regardless of the media used. Teletype is to be installed as soon as the fire alarm dispatchers can be trained in its proper usage. This will probably be sometime in 1956."

Disadvantages of the Leased Telephone System. The main disadvantage of the leased telephone system, from the point of view of some fire chiefs and communications superintendents, is that the control of maintenance personnel is in the hands of the telephone company rather than the municipality, and that in event of a strike by telephone company employees the emergency telephone service might be disrupted. Other city officials, however, believe that a 24-hour maintenance contract with the telephone company, using telephone company personnel, is superior to a city-maintained system. Miami is the only city with the telephone system that has experienced a strike and maintenance service on the emergency reporting system was not affected.

These and other "disadvantages" of the leased telephone type system were considered by a firm of consulting engineers employed by the city of New Orleans in the fall of 1955 to survey its fire alarm system, and the firm recommended that the city proceed with the installation of the telephone-type system mainly because of the relatively smaller capital investment required, but also because it can be used in reporting emergencies other than fire. It was believed also that while the over-all cost of the leased telephone and teletype system over a period of years would be about the same as for the telegraph system, the other usable features of the telephone system would justify any additional expense.

Some municipal officials, mainly fire chiefs and communications personnel, emphasize the advantages of having a communications system entirely owned and maintained by the city. From the point of view of other officials, however, and this also includes some fire chiefs, there is no particular advantage to a city owning and maintaining the communications system if adequate maintenance and service can be assured on a 24-hour basis by the telephone company. Such local officials know that the street box alarm systems generally have not been properly maintained, and that the telephone company is better equipped than most cities to provide round-the-clock maintenance service.

It is also claimed that a municipality has little or no control over the monthly rental charges of the telephone company and that such charges will exceed the cost of owning and maintaining a city-owned coded telegraph system. However, cost data reported by officials of some cities where the leased telephone system has been installed indicates that the telephone system is less costly or at least does not cost any more than the coded box system.

Opposition to the Telephone System. About 95 per cent of the telegraph box alarm systems now in use in American cities were made by the Gamewell Company, according to the article in Reader's Digest for September, 1954, and the men who install, maintain, repair, and sometimes operate the systems belong to the International Municipal Signal Association. The company and the association, often working through



the International Association of Fire Chiefs, lead the fight against telephone alarms, according to the Reader's Digest article.

The New England section of the International Municipal Signal Association in March, 1953, adopted a resolution "opposing any recognition by the National Board of Fire Underwriters in approving the use of the telephone as a substitute for the fire alarm box." The NBFU, in a letter to the IMSA expressed "regret" that its New England section had seen fit to adopt and give publicity to such a resolution because while the National Board has "standards" it has no requirements or regulations. The National Board's letter to the IMSA stated further that the NBFU "has no authority to regulate or require any particular type of alarm system or even any system at all. The NBFU cannot refuse to recognize whatever means of receiving and transmitting fire alarms may be available in a city, evaluating those means on the basis of their reliability and adequacy as evidenced by compliance or noncompliance with the intent of our standards (Pamphlet No. 73) as affecting reliability and adequacy."

During the past two years almost every issue of the Municipal Signal Engineer, the Journal of the International Municipal Signal Association, has carried articles favoring telegraph alarm boxes as against the leased telephone system, and reprints of such articles have been widely distributed to municipal officials throughout the country. One such article entitled "Fire Alarm Telegraph vs. Citizens Telephone Call Boxes" appeared in the July-August, 1955, issue, and another, entitled "Telephone Fire Alarm Systems or Telegraph Fire Alarm Systems--Which?" in the May-June, 1955, issue. Copies of these and other articles can be obtained from the IMSA, 130 West 42nd Street, New York 36, N.Y. The IMSA at its annual meeting in 1955 adopted a resolution opposing private ownership and control of fire or police emergency communication systems.

The IMSA favors the telegraph system as against the telephone system, according to Irvin Shulsinger, secretary of IMSA, because the control of the telegraph system is entirely in the hands of the municipality--not only the system but also the personnel and there is no chance that strikes will interrupt the service or cause delays in restoring service after any outage. Mr. Shulsinger also writes "the fire alarm telegraph system and fire alarm box has proved itself over the years. There is at present no substitute for its dependable, never-failing performance. Proposed telephone reporting systems are really not fire alarm systems at all. . . ." Mr. Shulsinger also states that telephone systems cost at least 50 per cent more than the telegraph system. No available data support this claim; comparative costs prepared by some cities with the leased telephone system show that it costs less than the telegraph system.

In February, 1954, the board of directors of the International Association of Fire Chiefs "listened to the recommendations of the special committee of the International Municipal Signal Association" and adopted a resolution which stated in part that "no contract for a telephone alarm system be entered into without the opinion of competent authority." In October, 1954, the IAFC general convention adopted a resolution as being unalterably opposed to any municipal alarm system which is not owned by and under complete control of the municipality. The IAFC, in the same resolution, condemned the article in Reader's Digest, referred to above, as being "an unduly biased and false case for the public telephone system," and voted that a copy of the resolution be sent to all fire departments.

The opposition of many fire chiefs and fire alarm superintendents to the telephone-type alarm systems has caused top municipal officials to hesitate to discontinue use of the telegraph system. Apparently firemen also are opposed to the telephone reporting system. The objections to it are reviewed briefly in a report of a



"committee on fire alarm versus telephone systems" of the International Association of Fire Fighters published in its journal, The International Fire Fighter, for May, 1955.

The Gamewell Company naturally has opposed the leased telephone alarm system as well as any other type except the telegraph box system which it manufactures. The position of the Gamewell Company has been set forth in a 37-page report entitled "Telephone vs. Telegraph Fire Alarm Systems," which the company issued in 1954. The Gamewell Company in 1948 had been found guilty by a federal court of indulging in monopolistic practices and the court in a suit brought by the federal government ordered the company to "terminate illegal practices and restore competitive conditions." The Attorney General of the United States issued a statement that the case was brought "to bring relief to public agencies that have been forced to pay exorbitant prices as a result of collusive dealings and monopolistic practices."

In 1951, in a contempt proceeding against the Gamewell Company, it was alleged that between 1948 and 1951 the company had given several cities reports on their fire alarm systems and recommended Gamewell products. The anti-trust division of the U.S. Department of Justice wanted the company to discontinue providing without charge "engineering services" and the recommending of any particular company's product. The court fined the company \$50,000 and imposed sentences upon the president and general sales manager, who are no longer with the company, but suspended the sentences.

In another case involving the Gamewell Company, the city of Phoenix, Ariz., on March 29, 1949, called for bids for a complete overhaul of its fire alarm system. The job went to the Gamewell Company at a cost of \$703,000. After \$287,123 had been paid to the company, a new city manager appointed early in 1950 looked into the circumstances surrounding the writing of the specifications and at the direction of the city council refused to make further payments. The Gamewell Company sued for the rest of the money, but the court promptly found for the city and ordered the company to repay the entire sum plus interest. The Gamewell Company appealed the decision to the United States Court of Appeals at San Francisco, which held that although the contract with the city was invalid because in awarding it the legal requirement for competitive bidding was not complied with, there was a part performance of the work and the city was not entitled to receive back the progress payments it made for the equipment delivered and the installations erected.

Upon petition for rehearing by the city of Phoenix it was pointed out that there was no evidence in the record to show the city had received benefits to equal the sum paid the Gamewell Company. The court agreed that its opinion was not as clear as it might have been but stated that Gamewell is entitled to retain no more than the reasonable value of the benefits received by the city. The opinion was amended so as to provide that the cause is remanded for a new trial upon the question whether Gamewell has received sums in excess of such benefits, and for which excess the city should recover, and that the parties could amend their pleadings to try the issue on what benefits had been received by the city. At the present time the city of Phoenix and the Gamewell Company are negotiating toward a possible settlement.

Position of National Board of Fire Underwriters. In determining a city's classification and base rate for fire insurance purposes, nine factors are evaluated by the National Board of Fire Underwriters, and one of these factors is the municipal fire alarm system. When the NBFU makes surveys of cities over 25,000 population it compares existing conditions with the standards set up for each factor (in the smaller cities the grading is done by company supported rating bureaus). Deficiency points are allotted when in the opinion of the grading engineer the city fails to meet the



standards. The number of points of deficiency determines the city's classification and the insurance rates that apply. Of the total 5,000 points of deficiency possible, the number allocated for fire alarm is 550. Standards for the fire alarm system are contained in Pamphlet No. 73 of the NBFU, entitled "Municipal Fire Alarm Systems," the latest edition of which was published in June, 1955. The standards in this pamphlet are applicable to the telephone type system as well as to the coded telegraph systems.

The NBFU does not endorse or recommend any particular type of alarm system, either telegraph or any other, and in determining "adequacy and reliability" consideration is given to the type of equipment used, its installation, and its manner of operation. Before installing the telephone reporting system in Syracuse and Indianapolis, for example, city officials asked the National Board for a tentative grading, and the NBFU notified the cities that installation of a telephone system of equal coverage and reliability, providing acceptable maintenance and operation is assured, would probably grade approximately the same as the telegraph system. It was assumed that insurance rates therefore would not be adversely affected. The National Board of Fire Underwriters on September 20, 1955, published two special interest bulletins, Nos. 301 and 302, dealing with telephone-type fire alarm systems. Copies of these two bulletins may be obtained on request to the National Board of Fire Underwriters, 85 John Street, New York 38, N. Y.

#### City-Owned and Operated Telephone Systems

Two cities have installed their own telephone systems instead of leasing telephone company installations. The city of Medford, Ore. (19,000), in 1954 installed 33 nondial phones in iron water-proof boxes. In the downtown area the phones are mounted on pedestals and in outlying districts on poles. Current for the system comes from the local power company with a standby generating plant to supply current to the telephone system, police-radio, and police station lighting in the event of a power outage.

The cost of the city-owned system in Medford was approximately \$10,000. The equipment, cables, switchboard, and outdoor telephones were installed by the city electrician with some help from an outside lineman. The boxes and phones were purchased as surplus from a telephone company that had supplied service to a nearby army camp. The cost of a telegraph box system with the same number of boxes would have been approximately \$40,000. During 1955 only one per cent of all calls received by the fire department came in over the telephone alarm system, 80 per cent over ordinary home phones, and 19 per cent over the police radio.

In Minneapolis, Minn. (522,000), the city fire department in 1955 installed a telephone inside the door of 22 Gamewell boxes in the downtown area (see photo on last page). The regular doors of the boxes were replaced with a new door on the outside of which are the words "Fire Alarm and Emergency Telephone." Instructions inside the door are "Pull the hook; lift telephone and talk to the operator." Thus the public can report fires and other emergencies without the use of a coin or dialing a number. When the phone is taken off the hook there is a visual and audible continuous signal at alarm headquarters until the phone is picked up by the operator and the switch is thrown to enable the operator to talk. The caller is then asked to pull the hook of the box alarm to give the location. The box alarm comes in over a separate wire and does not interfere with the conversation. Even if the hook is not pulled, the lifting of the receiver transmits a signal to alarm headquarters.

The combination box in Minneapolis was designed and installed by fire department personnel at a cost of about \$25 per box. The city plans to put from 10 to 20



telephones on a parallel circuit. Parts and materials from several makes of communications equipment, plus facilities made in the fire department shops, are used. The city has 607 Gamewell boxes and 64 separate police call boxes furnished by the telephone company and which are mounted on the same posts. The city has also designed and is in the process of assembling its own fire alarm headquarters equipment.

E. L. Heath, superintendent of communications in Minneapolis, believes that the public wanted an additional method of reporting fires, that something "other than the 1900 fire alarm box is overdue." Fire Chief R. C. Malmquist sees "tremendous possibilities" in the use of the telephone addition, and Mr. Heath says "we can get by with a lot less capital outlay."

#### Leased Telephone Emergency Reporting Systems

Municipal officials of cities where the leased telephone system had been installed or was in the process of being installed early in 1956 supplied the information presented in this section. Rental charges by the telephone company vary from city to city not only because of the different types of reporting and dispatching equipment installed, but also because mileage charges vary with the size of the city for connecting each call box to headquarters. Each telephone company also has its own tariffs on which charges for items of equipment are based.

Many cities are considering the installation of telephone reporting systems, including Phoenix, Ariz., and Eau Claire, Wis. In Eau Claire about 10 per cent of all calls come in on the Gamewell boxes and 83 per cent of these are false. Traverse City, Mich., has asked the telephone company for an engineering study on the installation of a telephone reporting system.

The plan proposed for Phoenix is quite different from the telephone reporting systems installed in other cities. In Phoenix (155,000), the Mountain States Telephone Company in July, 1955, submitted to City Manager Ray W. Wilson a proposal to furnish emergency telephone alarm service. The plan called for placing telephone booths at 123 intersections where traffic lights are located. An ordinary pay phone for general use would be installed in the booth. On the outside of each booth would be an emergency telephone for use by the public in making fire, police, and other emergency calls (see illustration on last page). The system would replace the present 146 telegraph alarm boxes.

Under the Phoenix proposal the telephone company would install all equipment at a cost to the city of \$667 and the city would sign a five-year termination contract of \$7,500 which would be assessed only if the switchboard were disconnected or moved within the five-year period after installation; the amount would be reducible one-sixtieth per month for the five-year period. The basic service charge per month to the city for the special switchboard and 160 extensions and five trunks would be \$2,400, less the estimated commission on 123 public pay telephones of \$630, making the monthly charge \$1,770. The city manager advised the council that the city would not be in a position to consider letting a contract for any type of emergency communication system until a settlement is reached with the Gamewell Company as discussed above in this report.

The officials of 16 cities with leased telephone systems supplied the following information. Replies were not received from North Bergen, N. J., and Muncie, Ind.; information on Roanoke, Va., has been presented above.

Miami, Florida (275,000): On July 27, 1953, Miami abandoned its 308 Gamewell telegraph boxes and installed 276 outdoor telephone boxes; 30 additional street



telephone boxes have been installed since 1953. The telephones are installed at every intersection within the city limits where either a typical three-light traffic signal or a blinker type of light has been installed. The equipment was built and installed by the Western Electric Company and it is owned and serviced by the Southern Bell Telephone and Telegraph Company. The emergency telephone system is operated by the division of communications which is one of the three divisions in the department of public safety.

The emergency telephone system was installed after the city commission had received a report from the city manager in August, 1952, based on a survey made by Ben Dcmby, the city's superintendent of communications. It had been estimated that the cost of rebuilding the old fire alarm system would amount to \$75,000 per year over a ten-year period. The old system had been used mainly for false alarms for during the survey period 63 per cent of the box alarms received were false alarms.

During the first 870 days of operation of the new emergency telephone system, up to and including December 13, 1955, a total of 6,981 alarms were received and 89 per cent came over the regular telephone, 5 per cent were received over the emergency telephone boxes, and 6 per cent were still alarms. Only 15 false alarms were received in this 870-day period, and for three consecutive Halloween nights Miami has not had one false alarm. In the 870 days of operation of the new emergency telephone system only 57 pieces of fire apparatus made the false alarm runs in comparison to the 535 pieces of apparatus dispatched during the final 300 day period under the old fire alarm box system.

The majority of the serious automobile accidents in Miami have been reported to the police department over the emergency telephone system. The new system is also being used by municipal employees who must maintain contact with headquarters at intervals during the working day.

Outage time for the emergency telephone system has been of no consequence as the repairs are made immediately by the telephone company upon notification from the alarm office. In case of any trouble only one telephone would be out of service and not a complete circuit of from 25 to 40 boxes. Early in 1955 during the 72-day telephone company strike the service of the emergency telephone system was in no way impaired, the telephone company keeping continuous service on these lines.

Since the installation of the emergency telephone system, the city officials of Miami have received more than 10,000 inquiries about this system. Officials from many other cities in the United States and the Latin American countries have visited Miami to inspect the system.

The emergency telephone system was installed by the telephone company at no cost to the city of Miami. The city pays the telephone company an average of \$15.60 per month per box on each of the 306 boxes and the entire system is maintained by the telephone company.

Syracuse, New York (221,000): The telephone reporting system furnished by the New York Bell Telephone Company was put in operation on October 1, 1955, together with a fire control central dispatch system. It replaced the 40-year old Gamewell system of 420 street-alarm boxes which was in need of rehabilitation as there had been excessive interference with service through grounding or shorting of wires. Moreover, in the past 20 years there had been a steady decline in the use by the public of telegraph alarm boxes for reporting fires. In 1952 only 11.7 per cent of all alarms were received over the telegraph box system as compared with 32.5 per cent in 1935. Residential telephones accounted for nearly 90 per cent of the city's fire alarms in 1954.



The widespread use of radio also had resulted in decreased use of telegraph boxes. Taxicabs as well as police, fire, public works, and other city-owned vehicles are equipped with radio. ADT installations in 100 business and commercial buildings also detect and report fires. Finally, another factor was that nearly all of the city's false alarms were reported over the telegraph box system with six out of every ten box alarms being malicious false alarms. Estimated costs of rehabilitating the telegraph system ranged from \$273,000 to \$670,000. An analysis of fire department records revealed that 44 per cent of the 420 street telegraph boxes had not been used once in five years, but that while the boxes were idle a great number of fires had been reported from the immediate area by ordinary telephone.

The distribution plan for 322 new telephone boxes was based on a detailed study of every street and boxes were recommended for location at the point of hazard. Where traffic lights are quite close together only every other intersection has an emergency reporting telephone. In the center of the city and in areas where the incidence of private telephones is not as great as in other areas, boxes are closely spaced. In congested high-value areas a box is located at every corner. Records will be kept of alarms and boxes will be relocated or discontinued on the basis of such studies.

The cost of installing the telephone system in Syracuse was \$7,515 plus a yearly rental of \$42,779. Signs for signalized intersections not having emergency telephones are estimated at \$200 and a tape recorder for recording and quick play-back of fire calls at \$500. City officials have estimated that the telephone system will save the city \$16,000 per year over the cost of rehabilitating and operating the old telegraph system. City officials reported on the basis of two month's experience that "the number of false alarms has sharply declined and dispatch has been speeded."

In Syracuse the telephone emergency reporting system is used by the public in reporting any type of emergency from fires to automobile accidents, and from water-main breaks to robberies. It is also for the use of city employees who find it necessary to get in touch quickly with their superiors.

Solvay, New York (7,868): The mayor and council decided that it was not desirable to renovate the old telegraph box-alarm system at a cost of \$150,000, not including the cost of replacing all power lines. Thus Solvay, in November, 1954, became the second city in the country to install a public emergency telephone alarm system leased from the telephone company. A total of 42 boxes were put on utility poles at street intersections. At the top of each pole is a red light. The system has its own power supply at the central switchboard in the police station in the municipal building. The entire system was installed at a cost to the village of \$816 and the monthly rental is \$264. After a year of operation Mayor Stanley E. Major reports: "We have been extremely happy with it. We have not had one single false alarm over the system to date. It has been used by our people to report accidents, fallen limbs during a heavy wind, and numerous other incidents that require attention immediately."

Indianapolis, Indiana (427,000): On December 3, 1955, the city put in operation 650 public emergency telephone alarm boxes (see photo of box on last page) terminating on telephone company emergency reporting consoles at fire and police headquarters. Special arrangements have been made so that patrolmen can report directly to police headquarters, by-passing fire headquarters. The system also provides a network of communications for civil defense agencies. Other features include push-button operation for answering an incoming call on the headquarters console, voice recording of all conversations, and graphic recording which prints the call-box number, time, and date each time a telephone reporting station is used. Also put into effect at the same time was a teletypewriter network (leased from the telephone company) with senders in the fire alarm office and receivers in each of the 30 fire stations. The new system



replaced a 50-year old 20 circuit Gamewell system with 533 pull boxes which was disconnected December 3, 1955. The 533 Gamewell box locations have been replaced by telephone instruments, and an additional 117 emergency telephones have been placed at sites selected by the city.

The city signed a five-year contract with the Indiana Bell Telephone Company, under which the city pays \$81,324 a year for rental of the equipment, including installation and maintenance. The contract with the telephone company specifies that if the city terminates the contract within five years the city will pay the telephone company a maximum of \$60,000, this charge to be reduced by \$1,000 for each month the system is in effect. After five years no termination charge will be applicable.

New Orleans, Louisiana (570,000): This city early in February, 1956, was negotiating a contract with the Southern Bell Telephone Company for the installation of a telephone emergency reporting system of 750 telephone boxes which will replace 375 telegraph boxes. The 55-year old telegraph system was so deficient that the National Board of Fire Underwriters had assessed 420 points of deficiency out of a total of 550 against the alarm system, and the NBFU in 1954 had recommended the installation of a complete new system. The city in 1953 had employed a firm of consulting engineers to survey the fire alarm system, and in a 67-page report the firm stated that a proposal from the telephone company to install a telephone system was "not to the best interest of the city." The engineers recommended that the 375 box alarms be increased to 4,000. No action was taken and in January, 1955, the mayor directed the city's chief administrative officer to make another study with a view to recommending some action to the council before the end of 1955.

On November 14, 1955, the acting mayor and the chief administrative officer submitted to the council a report recommending that the city's present obsolete fire alarm system be replaced by a modern leased telephone system under contract with the telephone company. Under the new plan 750 telephone reporting boxes will replace the 375 telegraph boxes. The system would be maintained by the telephone company and operated by the city's fire alarm division at a new headquarters to be provided in the new city hall. Accompanying the report submitted to the council was a 23-page report "Survey of Municipal Fire Alarm System for the City of New Orleans," prepared by a firm of consulting electrical engineers which recommended installation of the telephone system. Under the proposed contract with the telephone company, the city will pay an installation cost of \$38,795, plus an annual rental charge of \$133,263.

The proposed system and location of the boxes was submitted to the National Board and to the state rating bureau for review before the city let the contract. Eventually the city hopes to increase the number of telephone boxes to 1,500. For the present the city will install 200 boxes in the high value district, 300 in neighborhood and suburban shopping areas and near schools, hospitals, theaters, churches, warehouses, etc., and about 250 boxes along principal thoroughfares.

In residential neighborhoods it is anticipated that the great majority of fires will continue to be reported over the ordinary telephone. The city will continue to use the short-wave radio equipment to provide voice dispatching facilities from alarm headquarters to individual fire stations and also will continue the direct line PBX telephone system connecting the fire alarm headquarters switchboard with each fire station. In the central business district telephone wires for fire alarm purposes will be underground as well as in certain outlying areas but in some residential areas the cables will be overhead.

Omaha, Nebraska (251,000): On September 2, 1955, an emergency reporting system of 171 phones, of which 99 terminate on the new fire-reporting console and 72 on a



new police PBX at a different location, was placed in operation. The emergency reporting stations are located on alternate street corners in the high-value business district so that the distance to any station does not exceed one city block. Other emergency telephones are located in schools, theaters, hospitals, and other buildings. The telephones are installed on either wood utility poles or a 2-1/2-inch steel pipe. Above each telephone call box is a red and white emergency sign.

Fire fighting apparatus is equipped with a jack and plug arrangement which is automatically disconnected when the unit departs from the fire station thereby automatically lighting a "status" lamp on both the map and console at fire headquarters to indicate that the engine has departed. The lamp remains lit until the unit has returned to quarters and the plug is reinserted into the jack. When the unit of apparatus is again available for service the firemen call the dispatcher by radio and inform him that they are returning to quarters. Upon receipt of this information the dispatcher operates the key to light a green "availability" lamp on both the map and console, indicating that the apparatus is again available for another call by radio. The base station of the fire department's mobile radio system also is installed in the same building and the two radio transmitter-receiver sets are mounted on either side of the emergency reporting console (see photo on last page).

Sioux Falls, South Dakota (53,000): This city in January, 1956, replaced the telegraph box system with a telephone reporting system for fire and police leased from Northwestern Bell Telephone Company. The telephones are stationed in staggered locations so that the greatest distance to a telephone is one block. The emergency telephone boxes are mounted on steel posts in weather-proofed metal boxes. The annual cost for 29 telephones is \$1,717. Twelve more telephones will be installed at an annual cost of \$945.

Sheboygan, Wisconsin (42,000): The police-fire telephone alarm system was approved early in 1955, but because of legal difficulties actual installation was not started by the Wisconsin Bell Telephone Company until late in 1955. Telephones are being put in weather-proof boxes at strategic locations throughout the city. All calls will go directly to the switchboard at the city hall. The rental charge was estimated by city officials at \$4,000 less than the cost of operating the city's telegraph box-alarm system.

Highland Park, New Jersey (9,721): The new public emergency telephone system of 54 phone boxes was put into operation in April, 1955. All calls go direct to the switchboard at the new headquarters building of the fire and police departments. The new system makes it possible for foot patrolmen to call headquarters from almost any point in the borough. Under the former system there were only 10 police call boxes. At the switchboard a double light system is employed for protection against failure of any line, and both red lights go on in an emergency call. Double white trouble lights are used to indicate a "short" in the line or any other occurrence which might put the circuit out of action.

J. Ford Flagg, borough clerk, writes: "The system is working out very well. In addition to fire calls we have had accident emergency calls for the first-aid squad. Maintenance costs being fixed, we estimate this will be to our advantage over a long period, as we do not have to worry about the effect of snow storms or other causes of damage to alarm systems. So far we have every reason to believe the system superior to our former telegraph system, as our municipality is compact and practically all built up."

Phillipsburg, New Jersey (19,000): In March, 1955, this city placed in operation 66 street phones in boxes painted red, green, and yellow and mounted on utility



poles. The cost of installation was \$600 and the city pays an annual rental of \$8,400 which includes maintenance. The agreement with the telephone company provides that if the system is discontinued through no fault of the company within five years the town will pay a termination charge of \$3,400 reducible by one-sixtieth of this amount each month.

Princeton, New Jersey (12,230): This city recently installed 33 public emergency telephone boxes to replace the 27-box Gamewell system. The city pays \$314 per month or a total of \$3,771 per year rental on the new system. Borough clerk Robert F. Mooney reports that more than one-half of all calls received over the Gamewell system were false alarms. During the first four months after the telephone system was installed not one false alarm was received.

Lyndhurst, New Jersey (19,980): This city in the fall of 1955 contracted with the New Jersey Bell Telephone Company to install 64 outdoor telephones mounted on poles and one telephone located in the fire station at a total monthly rental charge of \$537 or \$6,444 a year. The New Jersey Bell Telephone Company has issued a booklet describing the system and giving instructions for its operation.

Two Rivers, Wisconsin (10,243): The General Telephone Company (not a part of the Bell system) in 1953 at the request of the city government installed telephone call boxes over a ten-block area in the main business district on an experimental basis. The city was widening the main street and placing all utilities underground, and the telephones were connected by underground cables directly to the police and fire headquarters. If a citizen opens the box and lifts the receiver, the fire board answers and if a policeman on duty wishes to make a call he clicks the phone several times and the police board answers. On the top of each box is a small red light, and if a desk sergeant wishes to call a patrolman on beat he can activate the light on the box.

During the two years that the telephone boxes have been in use in Two Rivers, not one false alarm has been turned in. Many calls have been made over these telephones to report accidents or to report someone sick or in distress and in need of help. The monthly rental per box including central equipment is \$4.80, and according to city manager John E. Dever maintenance by the telephone company has been excellent.

Massena, New York (13,137): This city has recently installed 24 telephone call boxes for use in reporting fires, accidents, and other emergencies to the fire and police departments. The switchboard is at police headquarters and all call boxes are connected individually and direct to the switchboard. The monthly rental of the 24 telephones is \$316.40. According to W. B. McMillan, village clerk, the new system is far superior to the telegraphic box alarm system which has been removed.

Lynbrook, New York (17,317): This city is in the process of installing approximately 150 telephone boxes under contract with the telephone company.

Kingston, Ontario (33,459): This city late in 1955 installed 25 telephone boxes, some of which replace Gamewell-type alarm boxes. The monthly rental cost to the city is \$318.25 from the Bell Telephone Company of Canada.

#### Other Types of Communication Facilities

The NFPA standards require that for a type "A" alarm system, two separate and distinct means must be provided for transmitting the signals received at fire alarm headquarters to the various fire stations. Usually direct telephone lines are used



for this purpose, and in addition short-range voice radio transmitting and receiving facilities are often employed, especially for contacting apparatus when it is out of the station. The standards also require that voice alarm transmission be graphically recorded for reference and this is done in some cities by the teletypewriter system which provides a permanent record at both the transmitting and the receiving ends. Such a system can also handle a large amount of message traffic which cannot be transmitted by the coded telegraph devices.

Beamed Microwave System. Still another adjunct of the regular alarm system is the beamed micro-wave radio transmitting and receiving equipment. This can handle both coded telegraph or teletypewriter and voice signals over several channels for distances not greater than 50 miles. It is expected that beamed micro-wave equipment will be greatly improved within the next few years but commercial types of units already are available commercially.

Initial costs of micro-wave equipment are quite high but maintenance costs are reasonable and the equipment can be installed in areas located at a reasonable distance from fire alarm headquarters at a considerable saving over the cost of expensive cable installations. It was estimated in New Orleans, for example, that the installation of seven beamed micro-wave units would cost \$49,000 for the equipment and \$10,500 for installation to replace cable installations in outlying areas.

City officials of Phoenix, Ariz., in 1953 saw the possibilities of microwave for municipal use. At the request of the city the Radio Corporation of America on September 15, 1953, agreed to furnish the necessary equipment for a pilot microwave fire alarm system. A single two-way link was installed between fire headquarters and a fire station about 2 1/2 miles distant. The equipment included a public address system in the fire station to announce all fire alarm and operational information; coded fire alarm signals to the fire station gong, register, and automatic light circuits; coded signals from a test fire alarm telegraph box in the fire station to a recorder at headquarters; and a telephone circuit between the two points. The coded signals were from a local circuit within the fire station for testing only but could just as well have been a complete municipal circuit routed throughout the area with a maximum of 60 street boxes.

The FCC granted Phoenix a developmental permit and the equipment was put in service on June 13, 1954. For the next seven months the fire apparatus at this particular fire station was dispatched by microwave with a total of 754 alarms transmitted over this system. The experiment was discontinued early in 1955 because city officials did not feel justified in buying another reporting system until the Gamewell case referred to earlier in this report has been settled.

The Phoenix experiment, according to officials of that city, shows that microwave is usable, and that as microwave becomes more widely used the cost of the equipment will be reduced; that clear line-of-sight beam paths are essential for a good signal; that once beam paths have been established they should be protected by amendments to the building code; and that a microwave system in Phoenix would cost between \$250,000 and \$300,000 or approximately one-half the cost of a coded telegraph box alarm system providing the same coverage.

Microwave communication systems sometimes are combined with two-way radio communication. Microwave systems are used by the state turnpike commissions in New Jersey, Pennsylvania, and Ohio; by the Washington State Highway Patrol; and by the city of San Diego, Calif. Available from the RCA Service Company, Inc., 816 West 58th Street, Chicago, Ill., are pamphlets entitled "What is Microwave?" (19pp) and "An Introduction to Microwave" (18pp). Pamphlets on this subject also are available from the Raytheon Manufacturing Company, 100 River Street, Waltham, Mass.



Ground-wave Radio Alarm System. The city of San Jose, Calif., arranged in 1948 with Jennings Radio Manufacturing Co. of that city for developmental work on a "ground-wave" all-purpose emergency radio alarm system. A committee of the City Managers' Department of the League of California Cities has since 1950 advised San Jose officials on the desired performance characteristics of the system and the test program. Basic experimental work determined the design of the equipment and demonstrated the practicability of the system.

A very small, inexpensive and low-battery-power transmitter is buried in the ground with a compact directional antenna, all sealed in a plastic bag; use may be made of sewer manholes and building basements. An alarm box with a telephone handset and mounted on a pole is connected to the transmitter. The signal is transmitted through the ground for a relatively short distance of one to two miles, with no sky-wave radiation. Two-way conversation is possible, plus transmission of a signal positively identifying the box location. Larger cities would require a receiver for each area of a one to two mile radius, plus automatic relaying of messages and signals to alarm headquarters.

The high attenuation, or fading out with distance, of the ground-wave signal assures that the low-powered ground-wave transmitters cannot interfere with conventional radio transmitters broadcasting on the same frequency at a distance from the ground transmitters; but such conventional broadcasting could interfere with ground-wave signals at the receivers of the ground-wave system. Hence, a clear channel must be assigned by the FCC if this system is to be practicable for widespread use. The major difficulty at this time is that some frequency within a relatively narrow specific band is required for successful operation of the system, and there are serious obstacles from the point of view of the FCC to making a clear channel available for a permanent municipal service within this band. The city of San Jose is now preparing to resubmit an application to the FCC for a two-year permit within the required frequency range, which will permit installation and use of the system on a pilot basis, during which period refinements would be made in the design of the equipment for potential manufacturing.

It is believed by San Jose officials that the ground-wave system holds the promise of providing all desirable performance characteristics attainable through the new telephonic alarm system, and permits in addition (1) municipal operation and control, and (2) greater economy both in investment and maintenance of equipment. The potential values of this system to cities may make it advisable for organizations of municipal officials to make representations to the FCC to show the municipal interest in the allocation of a clear channel within the frequency range required for the operation of the system.

Short-Range Radio System. Many cities have two-way or three-way FM radio facilities serving fire, police, and other departments and in some instances the operation of such systems has been centralized in a division of communications. Transmitting and receiving facilities are installed in fire apparatus and at the headquarters, and all fire alarms to fire stations generally are first transmitted over radio, with company responses checked over the PBX telephone circuits for verification.

Telephone companies provide not only call-box and teletype service but also radio service, and engineers from the telephone company will study police, fire, radio and other communications problems at no cost to the city, and will submit recommendations for a complete integrated system.



Telephone companies in some states, as in Wisconsin, for example, have provided a state-wide teletype system operated by the state police and likewise have provided state-wide police radio systems in New Jersey, New York, and Pennsylvania. Detailed information on communications facilities as related to police are found in Chapter 11, "Communications", in the book *Municipal Police Administration*, published in 1954 by the International City Managers' Association.

Radio equipment is now generally installed in all fire department officers' cars, and in many cities also in all pieces of apparatus and in each station. Radio enables fire companies to go out on special duty such as fire prevention work, and with the addition of walkie-talkie equipment individual firemen can keep in touch with their officers. The Federal Communications Commission in 1949 published a report, "Rules of Governing Public Safety Radio Services", and the International Association of Fire Chiefs in 1949 published a report "A Frequency Allocation Plan for the Fire Radio Service", and in 1954 the IAFC issued another report entitled "Manual of Radio Procedure for the Fire Service."

Combined Box Telegraph and Telephone System. Another type of alarm system which has been considered in a few cities is a city-owned, operated, and maintained combination system which would use the best features of both the coded telegraph and telephone types of system. In many cities there are private automatic telephone exchanges which are adaptable for the purpose of transmitting both fire alarm signals of the coded type as well as for providing voice communications facilities between telephone fire alarm boxes and fire alarm headquarters. The system also would provide both coded signal and voice transmission facilities between headquarters and fire stations.

It is stated that such a system would comply with National Board standards, would enable the city to own and operate the entire system, and would permit simultaneous transmission of two alarms from various points on one telephone box circuit. An important disadvantage would be the large capital expenditure required to install cables, lack of spare ducts in the existing utility system, hazards to underground cable installations, and the higher cost of operating and maintaining this system.

### Conclusion

City officials must always be on the alert for new and better ways of providing municipal services, and they should not be bound by tradition to any particular type of system or method. This was the concern of the International City Managers' Association in encouraging experiments with new types of emergency reporting systems, as in Phoenix and San Jose, and in suggesting that the A.T.&T undertake the development of a telephone-type communications system. This action by the ICMA reflected the concern of many city officials in the fact that very little if any change had been made in the method of reporting fires during the years when astounding developments were taking place in the electronics field.

The telephone company operated emergency reporting system still is relatively new, but the officials of the cities that have installed the system report satisfaction with it. Obviously, each city must decide whether or not to rebuild and extend its box telegraph system or to ask the telephone company to provide the service. Is there any advantage in owning the equipment as against leasing the telephone equipment? Which system offers the best financial arrangement from the point of view of the city? Which system provides the greatest freedom from interruption, from disasters such as floods, windstorms, and fires? If the telephone system is installed will the telephone company keep abreast of electronic developments and give cities the benefits of such developments? Cities that have the



leased telephone system will be in a good position to take advantage of any new system because they can easily discontinue the system if the telephone company does not keep it up to date.

In recent years many cities have installed various types of communications systems, and it is likely that more and more cities will centralize responsibility for the operation and maintenance of such systems. Cincinnati, Ohio, for example, has set up a division of communications which operates and maintains emergency communications facilities, including the city hall telephone exchange, fire alarm central office, police radio station, radio central office, radio repair and service shop, and radio telegraph. In addition, the division maintains two-way radio systems for four city departments.

The use of the leased telephone system for reporting of all types of emergencies may hasten the consolidation of communications facilities. It should be pointed out, however, that some of the telephone reporting systems, as for example the one installed in Indianapolis, can be used by police officers to report directly to police headquarters instead of going through the fire alarm office. Fire department personnel generally will not oppose a telephone reporting system if the switchboard terminates in the fire rather than the police headquarters or if it is set up in a central communications center.

If some type of radio-alarm system can be developed for public emergency use, it will have the advantage that the cost of cable installations, which account for 60 per cent or more of the total cost of an alarm system, can be avoided. Thus the telephone system may not be the last word in emergency reporting. Some municipal officials are convinced that the leased telephone boxes already are obsolete and are working with radio companies on radio-type systems. Perhaps the public will not make any greater use of the telephone system for reporting fires than it did of the telegraph alarm system. The telephone system, however, seems to have eliminated false alarms, and another great advantage is that, in addition to reporting fires, it can also be used for police calls as well as for reporting accidents and other emergencies. It also eliminates the necessity for having separate fire alarm and police call boxes on city streets.

There is a possibility that some cities may be able to obtain federal assistance in the financing of a communications system. Some cities have obtained federal matching funds for financing the installation of two-way radio systems for use in connection with civil defense purposes. The city of Syracuse, N. Y., applied for federal matching funds to finance both the capital investment and operating expenses of the new telephone emergency reporting system, but the city was turned down on the ground that the potential use of the system for civil defense purposes was vague. Syracuse officials now are working on a plan to use the telephone reporting system to assist in civil defense evacuation of the entire city, and the city intends to make another application for federal assistance.

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Recent publications of value to municipal officials include: (1) "Standards for the Installation, Maintenance, and Use of Municipal Fire Alarm Systems", pamphlet No. 73 of the National Board of Fire Underwriters, 85 John Street, New York 38, New York, issued in June, 1955, covers telephone-type systems as well as the coded telegraph system; (2) Special Interest Bulletins Nos. 301 and 302 dealing with the facilities and operation of telephone-type alarm systems, published September 20, 1955; available on request to the NBFU; (3) "Operating Manual" (1955, 16 pages) Indiana Bell Telephone Company, 240 North Meridian Street, Indianapolis 9. Available on loan from MIS are copies of three reports: (1) "Survey of a Municipal Fire Alarm System for the City of New Orleans, La.", 1955, 16pp; (2) Memo Submitted to the City Council of New Orleans by Acting Mayor Clasen and Chief Administrative Officer McGuire on May 14, 1955, entitled "Fire Alarm Recommendations"; and (3) "The Syracuse Fire Alarm System," 1955, 19pp.





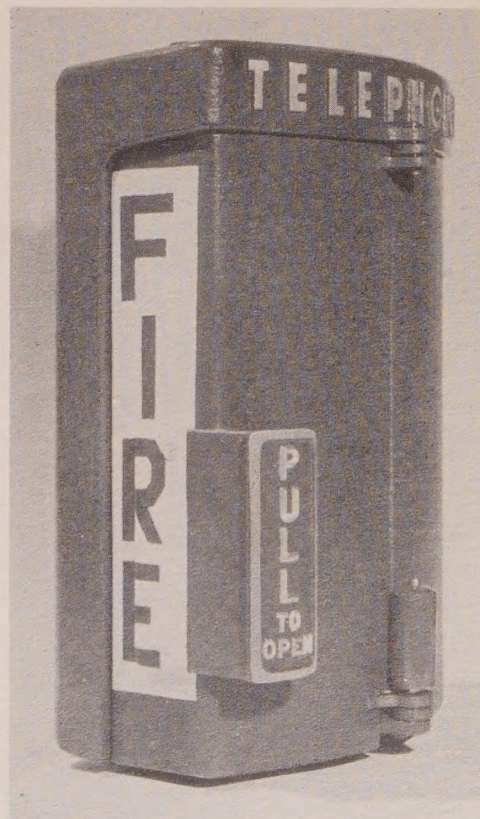
First Emergency Telephone Box Installed in a U. S. City - on Special Post and Sign in Roanoke, Va., in 1949.



Latest Type Emergency Reporting Telephone Set with Door Open.



650 of These Telephone Boxes Installed on Special Posts in Indianapolis



Latest Type Emergency Reporting Telephone Set with Door Closed; City Puts Additional Lettering on Door.

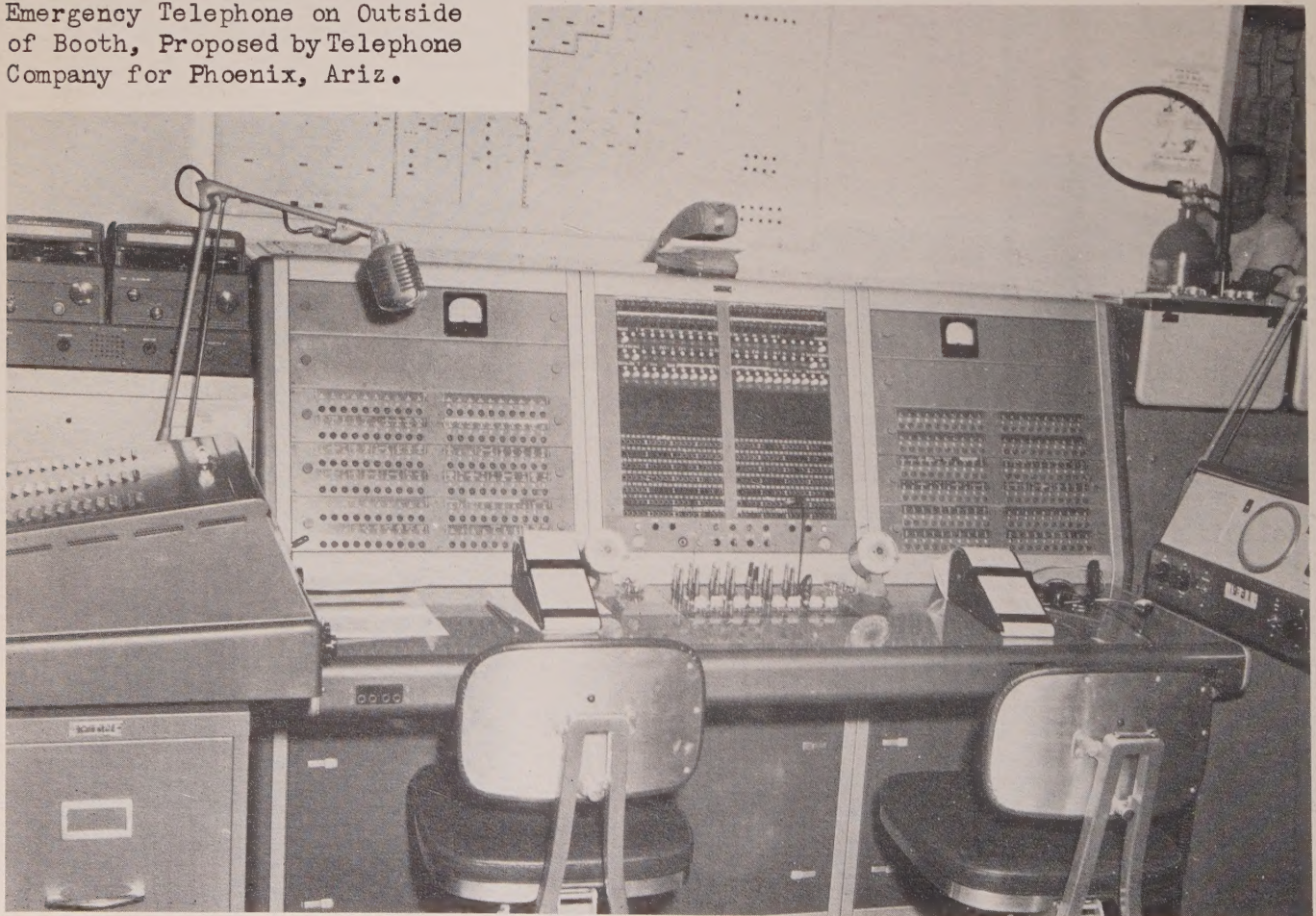




Public Telephone Booth with Emergency Telephone on Outside of Booth, Proposed by Telephone Company for Phoenix, Ariz.



A Gamewell-box in Minneapolis Showing Experimental Telephone Installed Inside of New Door Designed and Installed by Fire Department. Outside of Door Carries Lettering "Fire Alarm and Emergency Telephone".



Emergency Telephone Reporting Console and Associated Radio Equipment Installed in Omaha, Neb. (Complies with NBFU Pamphlet No. 73)